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Influence of Urban Residence on Use of Psychotropic Medications in Pennsylvania, USA: Cross-sectional Comparison of Older Adults Attending Senior Centers

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Abstract

Background—Differences in medication use by geographic region may indicate differences in access to specialist medical care, especially in the case of prescriptions for psychotropic medications. We assessed the effect of more or less urbanized residence on likelihood of psychotropic medication use in a large cohort of older adults in Pennsylvania, USA.

Methods—Community-dwelling older adults were recruited from senior centers across PA. Participant residences were geocoded and categorized according to U.S. Department of Agriculture Rural-Urban Continuum Codes. We used the codes to identify respondents who live in relatively urban counties with 250,000 or more residents (n=1360) or less urban counties with fewer than 250,000 residents (n=401). Participants reported prescription medications in a clinical interview. Psychotropic medications were categorized by class. Logistic regression models were estimated to assess the independent effect of residence on likelihood of psychotropic medication use.

Results—Geographic region was significantly associated with use of psychotropic medications. Psychotropic medication use was higher in less urban areas (19.7%) relative to more urban areas (14.2%), p =.007. In adjusted models, degree of urban residence was a significant correlate in models that adjusted for sociodemographic features and medical status (odds ratio, 1.62; 95% confidence interval 1.13–2.31, p < .01). Use of psychotropic medications on the Beers list also increased with less urban residence (13.0% vs. 8.3%, p = .005).

Conclusions—Older adults living in less urbanized areas are more likely to be prescribed psychotropic drugs. This difference may indicate a health disparity based on access to geriatric specialists or mental health care.

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Introduction

Prescriptions for psychotropic medications are common among older adults. A large Danish study showed that older age was associated with a higher probability of long-acting benzodiazepines use as well as use of three or more psychotropic drugs.[1] According to a Finnish study, two out of three community-dwelling older adults are prescribed at least one CNS medicine.[2] In the United States, nearly one in five community-dwelling elderly use psychotropic medications, primarily antidepressants followed by anti-anxiety agents.[3] Although psychotropic medications may help in the management of mental health conditions in older adults, the medications also carry risks for deleterious effects. For example, use of sedatives, hypnotics, antidepressants, and benzodiazepines may be associated with falls.[4] Adverse effects of anxiolytic and tricyclic medications may include psychomotor retardation, postural hypotension, and anticholinergic effects, which may cause blurred vision and cognitive impairment.[5]

Epidemiologic studies suggest that psychotropic medication use is more common in whites,[6] women,[3,7] and individuals who report poorer health.[3] In this research we ask if location, in particular degree of urban residential status, may also play a role in prescribing patterns for psychotropic medications.

In the United States, access to medical services varies by place. Geriatric and mental health services are less available in rural areas.[8–10] For example, the number of geriatricians per 10,000 older adults is lower in rural areas (from 1.48 in the most urban areas to 0.80 in the most rural). Similarly, board-certified internal medicine physicians are more plentiful in urban counties and not as accessible in less urban areas (27.29 vs. 3.85 per 10,000 older adults). The presence of family physicians varies less across the rural-urban continuum (ranging from 22.02 to 14.27 per 10,000 older adults) but still suggests less access to medical care in the rural sector.

Variation in psychotropic medication use may also reflect differences between older adults living in more and less urban areas, such as differences in medical status or sociodemographic features, or perhaps differences in the kinds of psychotropic medications prescribed. This research sought to determine (i) if differences in psychotropic medication use were evident across the more urban-less urban continuum, (ii) whether differences in psychotropic medication use persist in analyses that adjust for potential differences between more and less urban populations, and (iii) whether these differences were apparent for all classes of psychotropic drugs or only particular classes.

Methods

In 2010–2011 we enrolled a large group of community-dwelling seniors in Falls-Free PA, a research study comparing falls incidence among older adults completing Pennsylvania's *Healthy Steps for Older Adults*, a falls prevention program (n=814), and a comparator group of older adults from the same senior services sites who did not complete the program (n=1015). Both groups completed baseline interviews by telephone after providing informed consent, and all were followed up to a year in monthly automated or in-person telephone

interviews to track falls. Exclusion criteria included inability to provide informed consent, language other than English or Spanish, and inability to participate in telephone follow-up; otherwise all seniors attending PA Department of Aging programs were eligible.

Details of recruitment and follow-up for Falls-Free PA are reported elsewhere.[11] Briefly, the Falls Free-PA study enrolled participants in 19 counties. A total of 2459 older adults were ascertained at *Healthy Steps* senior center sites and agreed to give contact information to the research team. 90.5% (n=2219) signed informed consent, and 1835 subsequently completed baseline assessment and were eligible for follow-up. We excluded 74 participants who did not provide medication information or addresses that could be geocoded. A total of 1761 were included in analyses. The University of Pittsburgh Institutional Review Board approved the research.

Geocoding and Classification by Rural-Urban Status

The Rural-Urban Continuum Codes used in this paper are based on a methodology developed by the Economic Research Service of the US Department of Agriculture (USDA).[12] The rural-urban classification scheme distinguishes metropolitan counties by population size and nonmetropolitan counties by degree of urbanization and adjacency to a metropolitan area. Each county in the U.S. is assigned to one of nine categories. This detailed residential classification permits researchers to analyze patterns that may be related to degree of residential density and proximity to more populous areas.

While nine categories are available in the USDA classification, the Falls Free-PA sample was limited to residents mostly in the four most populous categories. The final distribution of participants included the following: *Highly Urbanized County*, “county in metro area with 1 million or more” (n=872); *Urbanized County*, “county in metro area of 250,000 to 1 million” (n=488); *Less Urbanized County*, “county in metro area of fewer than 250,000” (n=207); and *Rural County*, “non-metro county with urban population 20,000 or more, adjacent to metro area” (n=194). For analyses, we dichotomized the sample to define more urban (counties with 250,000 or more residents, n =1360, “highly urbanized” or “urbanized”) and less urban (counties with fewer than 250,000 residents, n=401, “less urbanized” or “rural”) regions.

Measures

Respondents reported birth date, race-ethnicity, gender, education, marital status, living arrangement, and adequacy of monthly income. To elicit medical conditions, respondents were asked if a physician had ever diagnosed any of the following: stroke, diabetes, high blood pressure, heart attack, macular degeneration, arthritis, osteoporosis, glaucoma, depression, chronic obstructive pulmonary disease, congestive heart failure, neuropathy, Parkinson’s disease, cognitive impairment, fractures, or cancer.

To elicit prescription medications, respondents were asked to gather all prescription medications and reported names of medications and daily regimens of use. We calculated the total number of prescription medications each respondent reported. Psychotropic medications mentioned by respondents were coded as antidepressant, anxiolytic, sedative-

hypnotic, or antipsychotic, as categorized by a clinical pharmacist. Thirty-five medications were assigned to psychotropic medication classes as shown in the Appendix.

Analyses

Descriptive statistics were calculated for the Falls Free-PA sample by geographic residential category. Participants in geographic groups were compared according to sociodemographic factors, prevalence of medical conditions, and use of psychotropic medications using t-tests to assess differences in means for continuous variables and χ^2 for differences in proportions. Logistic regression models were estimated to assess the effect of urban residence on likelihood of psychotropic medication use adjusting for other potential correlates of psychotropic use. Coefficients from the logistic regression models were exponentiated to give the change in the odds of psychotropic use for a one unit increase in each correlate independent of the effect of other correlates.

Results

Participants in Falls-Free PA were mostly white (88.2%) and female (79.2%), with a mean age (sd) of 75.5 (8.4) years. 38.6% of the sample reported education beyond high school, mostly 1–2 years of college or trade school. About half the sample reported solo residence. 22.8% of the sample resided in less urban areas, defined as counties with less than 250,000 residents. The mean number (sd) of prescriptions among respondents was 3.7 (3.0). A third reported five or more prescription medications.

To assess potential selection bias in the final analytic sample, we compared respondents who reported prescription drug information to the 4% of the sample who refused or did not supply information for other reasons (Table 1). Participants who declined or were unable to provide prescription drug information were older (77.7 vs. 74.9, p = .006) and less likely to have post-high school education (23.3% vs. 39.2%, p = .006). While minorities were overrepresented among participants not providing drug information, differences did not achieve significance. Level of urban residence was not associated with willingness to provide prescription drug information.

Comparison of Older Adults by Urban Residence

Sociodemographic characteristics were associated with urban status (Table 2). Respondents living in more urban counties were more likely to be female (80.4% vs. 74.3%, p = .008), more likely to report minority status (African-American, 10.2% vs. 1.8%, p < .001; Latino, 3.4% vs. 0.7%, p = .005), and more likely to have post-high school education (43.4% vs. 24.9%, p < .001). Residents of more and less urbanized areas did not significantly differ in reported difficulty with self-care activities (more urban, 5.9%; less urban, 6.2%, p = .18) or household maintenance tasks (more urban, 26.5%; less urban, 30.7%, p = .26).

Urban status was not associated with the prevalence of self-reported medical conditions except diabetes (30.2% in less urban vs. 22.6% in more urban counties, p=.002). The groups were similar in the proportion reporting stroke, hypertension, myocardial infarction, macular degeneration, arthritis, osteoarthritis, glaucoma, history of depression or anxiety, chronic obstructive pulmonary disease, congestive heart failure, peripheral neuropathy, Parkinson's

disease, and cancer. Residents of more urban counties did not significantly differ in a count of medical conditions (2.8 in more urban, 2.9 in less urban). The proportion of older adults using at least one prescription medication also did not differ by region: 92.6% in more urban areas, 92.3% in less urban areas. The mean (sd) number of prescription medications was marginally higher among less urban residents: 4.0 (3.2) vs. 3.7 (2.9), p = .049.

Use of Psychotropic Medications by Urban Residence

In this statewide sample of older people using senior center services, 15.4% reported current use of at least one psychotropic medication (see Appendix for medications). By class, 11.4% reported use of an antidepressant, 5.1% an anxiolytic, 0.9% a sedative-hypnotic, and 0.7% an antipsychotic (Table 3).

Urban status was associated with use of psychotropic medications (Table 3). In less urban areas, 19.7% reported a psychotropic medication compared to 14.2% in more urban areas (p = .007). Using the full range of USDA rural-urban continuum codes, psychotropic medications were reported by 13.3% of seniors in highly urbanized counties, 15.8% in urbanized counties, 17.4% in less urbanized counties, and 22.2% in least urbanized counties (p=.015).

Differences in Psychotropic Medication Prescription by Urban Residence: Multivariable Models

To assess the independent effect of urban status on likelihood of psychotropic medication use, we estimated a series of logistic regression models to adjust for the effects of potentially confounding variables (Table 4). Models included sociodemographic indicators and two approaches to disease conditions. Models 1 and 2 included history of depression or anxiety because of the strong association between these mental health conditions and use of psychotropic medication. Model 3 included a count of all reported disease conditions. We also varied urban residence status. Model 1 included the dichotomous indicator, and models 2 and 3 the four-level continuum indicator.

In logistic regression models, women were significantly more likely to report psychotropic medication use (OR=2.43–2.66, p < .001). Older age and living alone were independently associated with lower risk of psychotropic drug use, which achieved significance in models that included a count of medical conditions. Marital status and years of education were not significant as correlates of psychotropic use, and living alone was a significant correlate only in one of the three models. Strong associations were evident for medical correlates, most notably history of depression and anxiety. The very high odds ratios suggest that this measure identified a subset of respondents with current treatment for psychiatric conditions. For each additional medical condition reported, respondents were about 20% more likely to report use of a psychotropic medication (Model 3).

Urban residence status was a significant correlate of psychotropic drug use in each of the multivariate models. Using the dichotomous measure in Model 1, older adults living in counties with less than 250,000 people were significantly more likely to report psychotropic medications (OR=1.62, 95% CI: 1.13, 2.31, p < .01) after adjustment for sociodemographic factors and presence of reported mental health conditions. Model 2 included the full

continuum of more urban-less urban residence and showed that this effect is driven mostly by greater use of psychotropic medications in people at the least urbanized end of the continuum. Odds ratios were higher in “less urbanized counties” (county in metro area of fewer than 250,000; OR 1.56 [0.95, 2.55]) and in “rural counties” (non-metro county with urban population 20,000 or more, adjacent to metro area; OR 1.68 [1.03, 2.72], $p < .037$). The significance of residing in the least urbanized areas was confirmed in Model 3, which adjusted for the number of reported disease conditions.

Differences between More and Less Urbanized Areas by Class of Psychotropic Medication

By drug class, older adults in more and less urban areas differed significantly only in use of anxiolytics (7.0% vs. 4.5%, respectively, $p = .045$) (Table 3). Overall, 2.5% of respondents reported prescriptions in more than one class of psychotropic medication, which did not differ by location.

As shown in the Appendix, 26 of the 35 medications tracked in this study appear on the 2012 Beers list as potentially inappropriate medications for patients aged 65 years or older. [13] More and less urbanized residents differed in the proportion with a psychotropic medication on the Beers list. Among residents in more urban counties, 8.3% reported a psychotropic medication on the Beers list compared to 13.0% among less urban residents ($p = .005$). Prescriptions for psychotropic medications on the Beers list increased across the more urban-less urban continuum: 8.1% in highly urbanized counties, 8.6% in urbanized counties, 9.7% in less urbanized counties, and 16.5% in least urbanized counties ($p = .004$).

Discussion

In this sample of older adults ascertained in senior centers, prescriptions for psychotropic medication prescriptions ranged from 13.3% in the most highly urbanized counties to 22.2% in less urban areas. Using the threshold of 250,000 people to separate counties, we found that 19.7% of older adults in less urban areas reported a psychotropic medication compared to 14.2% in more urban areas. These figures are in accord with findings from other studies. [3] Despite growing awareness of the potential risks of psychotropic medication use, about one in five older adults in less urban areas receive prescriptions for these classes of medication.

We found that gender, age, and medical conditions, both psychiatric conditions and total count, were associated with use of psychotropic medications. Consistent with other studies, women were twice as likely to report use of the medications.[3] Participants under age 75 were more likely to report use of psychotropic medications than people over age 75. This finding contradicts findings of Nordic studies showing that older age is associated with greater use of benzodiazepines, antidepressants, anxiolytics, antipsychotics, and hypnotics. [14, 15] A possible reason for these differences may be sources of data. The Nordic studies relied on administrative pharmacy claims, while medication information in the Falls Free-PA sample was established in an interview.

After controlling for sociodemographic and disease status measures, urban residence was still significantly associated with use of psychotropic medications. Residents of less urban

counties were nearly twice as likely to report use compared to more urban counties. We did not find as strong a trend for polypharmacy. As noted earlier, the mean number of prescription medications was only marginally higher among less urban residents: 4.0 vs. 3.7.

Possible explanations for the greater use of psychotropic medications in less urban areas include less access to geriatricians, psychiatrists, and mental health care specialists generally.[10,16] In less urban settings, family physicians and general internists are more likely to address mental health among older adults than specialists.[9] One study found that medical generalists score lower than geriatricians on appropriate prescribing and proactive assessments for geriatric and psychological syndromes, which may help explain the greater rates of psychotropic medication prescriptions in these areas.[17] More generally, medical generalists are unlikely to receive geriatrics training.[18] Recognizing this problem, interventions have been developed to help lower inappropriate prescribing for older adults.[19]

Limitations of our study should be noted. The use of a senior center sample does not allow us to generalize results to older adults as a whole, nor does it provide an accurate representation of the entire older U.S. population. Importantly, the Falls Free-PA sample does not adequately represent the most rural localities. We relied on participants' self-reports on prescription medications and co-morbidity, which might be less accurate than collecting pharmacy claims or other data from participants' medical files. Finally, we were unable to collect information on sources of medical care, and, most critically, who prescribed psychotropic medications.

Conclusions

This study confirms the high prevalence of psychotropic medication use, with less urban residence as a risk factor for psychotropic medication use. Our findings highlight the need for a proactive approach that involves assessment of the appropriateness of psychotropic medications. Findings regarding psychotropic medications in this sample raise two key concerns. First, while 15.4% of respondents were taking a psychotropic medication, 2.5% were taking medications involving two or more classes of psychotropic medication. Use of multiple classes of psychotropic drugs is a concern, since the effectiveness of combining different types of psychotropic medications is questionable.[20] Second, of the 35 medications tracked in this study, 26 appear on the 2012 Beers list as potentially inappropriate medications for patients aged 65 years or older (Appendix),[13] and less urbanized residence was associated with greater use of these Beers-list medications. Our results suggest that residents of less urbanized may be at higher risk for potentially inappropriate prescribing of psychotropic medications.

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Appendix

Name (Generic/Brand)	Beers	Antidepressant	Anxiolytic	Sedative-Hypnotic	Antipsychotic
Amitriptyline (Elavil)	X	X			
Bupropion (Wellbutrin)	X	X			
Citalopram (Celexa)	X	X			
Desvenlafaxine (Pristiq)		X			
Doxepin (Sinequan)	X	X			
Duloxetine (Cymbalta)		X			
Escitalopram (Lexapro)		X			
Fluoxetine (Prozac)	X	X			
Mirtazepine (Remeron)	X	X			
Nortriptyline (Pamelor)	X	X			
Paroxetine (Paxil)	X	X			
Sertraline (Zoloft)	X	X			
Tranylcipramine (Parnate)		X			
Trazodone (Desyrel)		X			
Venlafaxine (Effexor)		X			
Alprazolam (Xanax)	X		X		
Buspirone (Buspar)			X		
Clonazepam (Klonopin)	X		X		
Clorazepate (Tranxene)	X		X		
Diazepam (Valium)	X		X		
Lorazepam (Ativan)	X		X		
Oxazepam (Serax)	X		X		
Temazepam (Restoril)	X		X		
Eszopiclone (Lunesta)				X	
Zolpidem (Ambien)	X			X	
Aripiprazole (Abilify)	X				X
Asenapine (Safris)	X				X
Fluphenazine (Prolixin)	X				X
Haloperidol (Haldol)	X				X
Lithium (Eskalith, Lithobid)					X
Olanzepine (Zyprexa)	X				X
Perphenazine (Trilafon)	X				X
Quetiapine (Seroquel)	X				X
Risperidone (Risperdal)	X				X
Ziprasidone (Geodon)	X				X

Table 1

Falls Free, PA: Features of Respondents According to Availability of Prescription Information

	Provided Information on Prescription Medications (n = 1761)	Did Not Provide Information (n = 74)	p
Age, mean (sd)	74.9 (8.4)	77.7 (9.8)	.006
Women, %	79	82.4	.48
Widow, %	44.1	51.4	.22
African-American, %	8.3	15.5	.23
Latino, %	2.8	5.4	.19
Any post-HS education, %	39.2	23.3	.006
Living alone, %	52.8	60.8	.38
Residence in more rural region (counties with < 250,000 people)	22.8	23.4	.48

Table 2

Falls Free, PA: Sociodemographic Status by Region

Descriptive	County Population 250,000 or more (n = 1360)	County population Less than 250,000 (n = 401)	p
Age, Mean (sd)	75.0 (8.3)	74.5 (8.7)	.30
Women, %	80.4	74.3	.008
Widow, %	44.2	43.8	.88
African-American, %	10.2	1.8	< .001
Latino, %	3.4	0.7	.005
Any post-HS education, %	43.4	24.9	< .001
Living alone, %	53.8	49.4	.29

Table 3

Falls Free, PA: Medication Use by Region

Descriptive	County Population 250,000 or more (n = 1360)	County population Less than 250,000 (n = 401)	p
Any Psychotropic, %	14.2	19.7	.007
Psychotropic Class, %			
Antidepressant	10.9	13.2	.20
Anxiolytic	4.5	7.0	.045
Antipsychotic	0.8	0.5	.52
Sedative-Hypnotic	0.7	1.2	.33

Note: 2.5% of respondents reported medication in more than one class; hence classes do not sum to percentages indicated by “any psychotropic.”

Table 4

Falls Free, PA: Correlates of Psychotropic Medication Use

	Model 1	Model 2	Model 3
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender			
Male	1.0	1.0	1.0
Female	2.66 (1.68, 4.20)***	2.66 (1.68, 4.20)***	2.43 (1.56, 3.78)***
Marital Status			
Married or other status	1.0	1.0	1.0
Widowed	0.97 (0.67, 1.42)	0.98 (0.67, 1.43)	0.75 (0.53, 1.06)
Education			
Up to 12 years	1.0	1.0	1.0
Higher education	0.85 (0.61, 1.18)	0.85 (.0.61, 1.18)	0.75 (0.55, 1.01)
Age			
75 years or less	1.0	1.0	1.0
76 years or more	0.78 (0.56, 1.09)	0.78 (0.56, 1.10)	0.58 (0.43, 0.79)***
Live alone			
No	1.0	1.0	1.0
Yes	0.87 (0.61, 1.23)	0.87 (0.61, 1.23)	0.61 (0.44, 0.85)**
History, Depression or Anxiety			
No	1.0	1.0	
Yes	17.6 (12.8, 24.2)***	17.6 (12.7, 24.2)***	
Region			
≥250,000, More Urban	1.0		
< 250,000, Less urban	1.62 (1.13, 2.31)**		
Count of Medical Conditions			1.20 (1.10, 1.30)***
Region			
Highly Urbanized		1.0	1.0
Urbanized		0.99 (0.69, 1.45)	1.13 (0.81, 1.59)
Less Urbanized		1.56 (0.95, 2.55)	1.41 (0.91, 2.19)
Rural, Least Urbanized		1.68 (1.03, 2.72)*	1.70 (1.09, 2.64)*
Model Fit, χ^2, df	424.7, 7, p < .001	424.8, 9, p < .001	70.1, 9, p < .001
R^2	.38	.38	.08

* p < .05,

** p < .01,

*** p < .001